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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/682,381	10/08/2003	Won-Joon Choi	073169/0293448	7826

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EXAMINER	
O CONNOR, BRIAN T	
ART UNIT	**PAPER NUMBER**
2616	

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08/01/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

a.

Office Action Summary	**Application No.**	**Applicant(s)**	
	10/682,381	CHOI ET AL.	
	Examiner	**Art Unit**	
	Brian T. O'Connor	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-71* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-71* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date *4/19/2004*; 4/14/2005; 8/5/2005

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The attempt to incorporate subject matter into this application by reference to "Attorney Docket No. 73169-293275" is ineffective because essential material for the instant application must be incorporated by reference to a U.S. patent application publication. The Examiner suggests referring to the U.S. Application number (xx/yyy,yyy) or the PGPub document number (US xxxx/yyyyyyy) for the co-pending application.

Claim Objections

2. Claim 39 is objected to for depending upon claim 1; the Examiner believes claim 39 is intended to depend from claim 38 and is treating claim 39 as depending on claim 38. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 35 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "good" in claim 35 is a relative term which renders the claim indefinite. The term "good" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term "good" applied to a transmit path could mean the path is working or that the path has an accepted bit error rate level or signal-to-noise ratio.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-14, 20, 21, 29-33, 35-50, 56, 57, 65-67, and 69-71 are rejected under 35 U.S.C. 102(e) as being anticipated by Sugar (US 6,687,492; hereafter Sugar).

With respect to claims 1 and 38, Sugar disclose a method of beamforming and a beamformer (500 of Figure 8) to process N digital OFDM signals that carrying data in K frequency bins of a buffer (520 of Figure 8; column 11, lines 1-10). The Beamformer phase steers all K frequency bins for every signal N with multipliers (510 of Figure 8; column 11, lines 13-18) and employs IFFT units (530 of Figure 8) for all K frequency bins and every signal N. The number of frequency bins is K (set to 52; column 11, line 6) and the number of signals is N (set to 2; column 12, lines 30-32).

With respect to claims 2 and 39, Sugar further discloses a processor (322 of Figure 2; column 4, lines 10-20) for calculation of transmit weights by a process (Figure 3; Figure 7; column 10, lines 4-15) and a memory (324 of Figure 2; viewed as equivalent to a block) for storing the weights until the N signals and K frequencies are ready to transmit. The weights also use a channel response (channel estimate) for multi-channels between the transmitting device and the receiving device (column 5, lines 40-64). Each IFFT (530 of Figure 8) will sequential load the processed phase steered data from buffer (520 of Figure 8).

With respect to claim 3, Sugar further discloses that all the channel estimates are stored in a channel matrix for every channel and every frequency (column 8, line 61 – column 9, line 6).

With respect to claims 4 and 40, Sugar further discloses that the weight vector calculation includes a weighting function "p(f)" to apply gain to the beamforming technique (column 7, lines 15-20).

With respect to claims 5 and 41, Sugar further discloses that every IFFT (530 of Figure 8) will sequential load the processed phase steered data from buffer (520 of Figure 8).

With respect to claims 6 and 42, Sugar further disclose that the processor (322 of Figure 2) will use data with gain information from the receiver (314 of Figure 2) to compute weights (column 4, lines 60-67).

With respect to claims 7 and 43, Sugar further discloses that the computation of the weights (Figure 3) occurs for a beamformer that shares antenna (302 of Figure 2) for a receiver and a transmitter (312, 314 of Figure 2).

With respect to claims 8 and 44, Sugar further discloses that the computation of the weights (Figure 3) occurs for a beamformer that shares multiple antennas (302, 304 of Figure 2) for a receiver and a transmitter (312, 314 of Figure 2).

With respect to claims 9 and 45, Sugar further discloses that the processor (322 of Figure 2) will use a channel response (channel estimate) (column 5, lines 40-64) from the receiver (314 of Figure 2) to compute weights (column 4, lines 60-67).

With respect to claims 10 and 46, Sugar further discloses that the computation of the weights (Figure 3) occurs for a beamformer that shares antenna (302 of Figure 2) for a receiver and a transmitter (312, 314 of Figure 2).

With respect to claims 11 and 47, Sugar further discloses that the computation of the weights (Figure 3) occurs for a beamformer that shares multiple antennas (302, 304 of Figure 2) for a receiver and a transmitter (312, 314 of Figure 2).

With respect to claims 12 and 48, Sugar further discloses that several receivers (302, 304, 306, 308 of Figure 2) and channels receive multiple channel estimates over time (420, 430, 440, 450, 460 of Figure 3).

With respect to claims 13 and 49, Sugar further discloses that the channel responses (channel estimates) (column 5, lines 40-64) from the receiver (314 of Figure 2) are derived from the communication channels that employ the responses (110, 210, channels of Figure 1; 410, 420, 430, 440 of Figure 3; column 5, lines 61-64).

With respect to claims 14 and 50, Sugar further discloses that all the channel estimates are stored in a channel matrix for every channel and every frequency (column 8, line 61 – column 9, line 6).

With respect to claims 20 and 56, Sugar further discloses that the weight processor generated complex weights in a vector to reduce interference from the channel effects that must include differences due to antenna and circuit differences (column 10, lines 33-45).

With respect to claims 21 and 57, Sugar further discloses that the beamformer (500 of Figure 8) possess N D/A units (550 of Figure 8), N RF circuitry units (560 of Figure 8), and N antennas (580 of Figure 8) sequentially connected in series.

With respect to claims 29 and 65, Sugar further discloses that the signals are 802.11a signals (column 11, lines 4-7).

With respect to claims 30 and 66, Sugar further discloses that number of signals and antennas is equal to 2 (column 12, lines 30-32).

With respect to claims 31 and 67, Sugar further discloses that number of signals and antennas is equal to 4 (302, 304, 306, 308 of Figure 2).

With respect to claims 32 and 33, Sugar further discloses that a single antenna (580 of Figure 8) transmits the RF signal and frequency bins for a single one of N signals.

With respect to claims 35 and 69, Sugar further discloses that only one of the N antennas may be used to transmit signals (column 13, lines 28-39) and that a non-beamforming terminal is receiving the signals. Thus at least one of the N antennas would not have a good transmit path, i.e. the path as a lower signal-to-noise ratio than other paths.

With respect to claims 36 and 70, Sugar further discloses that the array beam shaped is processed to minimize the effects of interferers and noise; both of these effects are caused by the channel (column 8, lines 46-50).

With respect to claims 37 and 71, Sugar further discloses that the array beam pattern forms are frequency distinct (column 8, lines 51-56).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 15 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Ma (US 2004/0037218).

With respect to claims 15 and 51, Sugar fails to disclose weights used to assign constant power for each of the frequency bins so that the spectrum is flat.

Ma discloses, for an OFDM receiver, which uses an equalizer to flatten the signal spectrum will improve OFDM system performance (paragraph **[0005]**). One of ordinary skill in the art would realize the same equalizer would be an improvement for an OFDM transmitter.

Ma realizes the benefit of better OFDM performance by using an equalizer to flatten a signal spectrum. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Ma with the beamformer and method of Sugar.

9. Claims 16 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Medvedev et al. (US 6,862,271; hereafter Medvedev).

With respect to claims 16 and 52, Sugar fails to disclose processing the weights by normalizing them based upon an Effective Isotropic Radiated Power limit and a per-channel power limit.

Medvedev discloses allocating transmit power over a group of antennas (218 of Figure 2) based upon a transmitted power limit for the system and every antenna in the system (column 8, lines 43-61).

One of ordinary skill in the art would realize the benefit of greater spectral efficiency by using the transmission scheme of Medvedev. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Medvedev with the beamformer and method of Sugar.

10. Claims 17-19 and 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Hottinen et al. (US 6,754,286; hereafter Hottinen).

With respect to claims 17 and 53, Sugar fails to disclose using complex weights with discrete values having less than full resolution.

Hottinen discloses storing discrete complex values (phase) with less than full resolution (Figure 3C; Figure 4).

One of ordinary skill in the art would realize the benefit of reduced memory size and cost by storing complex value with lower resolution. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Hottinen with the beamformer and method of Sugar.

With respect to claims 18 and 54, Sugar fails to disclose using 3-bit binary numbers to represent complex weights.

Hottinen discloses storing discrete complex values (phase) with 3-bit binary numbers (Figure 3C).

One of ordinary skill in the art would realize the benefit of reduced memory size and cost by storing complex value with lower resolution. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Hottinen with the beamformer and method of Sugar.

With respect to claims 19 and 55, Sugar discloses the beamformer with 4 channels or 4 antennas (column 14, lines 7-10). Sugar fails to disclose using 3-bit binary numbers to represent complex weights.

Hottinen discloses storing discrete complex values (phase) with 3-bit binary numbers (Figure 3C). One of ordinary skill in the art would realize this combination would result in a 12-bit x 3-bit multiplier of complex weights.

One of ordinary skill in the art would realize the benefit of reduced memory size and cost by storing complex value with lower resolution. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Hottinen with the beamformer and method of Sugar.

11. Claims 22-23, 34, 58-59, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Sugar et al. (US 6,862,456; hereafter Sugar-456).

With respect to claims 22 and 58, Sugar fails to disclose a broadcast mode. Sugar discloses that only one of the N antennas may be used to transmit signals (column 13, lines 28-39) and that a non-beamforming terminal is receiving the signals.

Sugar-456 discloses a beamforming AP (110 of Figure 1) that sends multicast signals to a group of receivers (120, 130, 140, 150 of Figure 1; column 1, lines 51-60; where multicast is viewed as equivalent to broadcast).

Sugar-456 realizes the benefit of improved packet error rates by broadcasting signals. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Sugar-456 with the beamformer and method of Sugar.

With respect to claims 23 and 59, Sugar fails to disclose a broadcast mode. Sugar discloses that only one of the N antennas may be used to transmit signals (column 13, lines 28-39) and that a non-beamforming terminal is receiving the signals.

Sugar-456 discloses a beamforming AP (110 of Figure 1) that sends multicast signals to a group of receivers (120, 130, 140, 150 of Figure 1; column 1, lines 51-60; where multicast is viewed as equivalent to broadcast).

Sugar-456 realizes the benefit of improved packet error rates by broadcasting signals. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Sugar-456 with the beamformer and method of Sugar.

With respect to claims 34 and 68, Sugar discloses that only one of the N antennas may be used to transmit signals (column 13, lines 28-39) and that a non-beamforming terminal is receiving the signals. However, Sugar fails to disclose a broad mode for the beamformer.

Sugar-456 discloses a beamforming AP (110 of Figure 1) that sends multicast signals to a group of receivers (120, 130, 140, 150 of Figure 1; column 1, lines 51-60; where multicast is viewed as equivalent to broadcast).

Sugar-456 realizes the benefit of improved packet error rates by broadcasting signals. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Sugar-456 with the beamformer and method of Sugar.

12. Claims 26 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Gore et al. (US 6,917,820; hereafter Gore).

With respect to claims 26 and 62, Sugar fails to disclose an aging threshold used to outdate the channel estimate so that the channel estimate is no longer used.

Gore discloses a timer value or threshold C (407 of Figure 2) used to expire or outdate a current channel estimation matrix so that when a timer expires the current channel estimation matrix is erased and not longer used (403, 404, 407 of Figure 2; column 5, lines 30-42).

One of ordinary skill in the art would realize the benefit of increased efficiency by updated the channel estimate at regular intervals so that undetected channel characteristics are found an included in the beamformer. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Gore with the beamformer and method of Sugar.

13. Claims 28 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Ikegami (US 6,393,032).

With respect to claims 28 and 64, Sugar fails to disclose transmitting a CTS signal in order to solve a hidden node problem.

Ikegami discloses solving a hidden wireless terminal problem by transmitting a CTS signal (A, B, C, D of Figure 3; column 4, lines 10-24; column 10, lines 4-21).

Ikegami realizes the benefit of greater transmission rates by using a CTS signal to solve a hidden terminal problem. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Ikegami with the beamformer and method of Sugar.

14. Claims 24-25 and 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Sugar-456 and further in view of Ikegami (US 6,393,032).

With respect to claims 24 and 60, Sugar fails to disclose an antenna transmitting an RTS signal.

Ikegami discloses wireless terminal transmitting an RTS and a CTS signal (A, B, C, D of Figure 3; column 4, lines 10-24; column 10, lines 4-21).

Ikegami realizes the benefit of greater transmission rates by using a CTS signal and an RTS signal to transfer data frames. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Ikegami with the beamformer and method of Sugar.

With respect to claims 25 and 61, Sugar fails to disclose an antenna transmitting an RTS signal and a CTS signal.

Ikegami discloses a wireless terminal transmitting a RTS and a CTS signal (A, B, C, D of Figure 3; column 4, lines 10-24; column 10, lines 4-21). One of ordinary skill in the art would realize that channel estimate information would be available for use in the CTS signal that had traversed the communication channel in response to a RTS signal.

Ikegami realizes the benefit of greater transmission rates by using a CTS signal and an RTS signal to transfer data frames. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Ikegami with the beamformer and method of Sugar.

15. Claims 27 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugar in view of Gore and further in view of Ikegami (US 6,393,032).

With respect to claims 27 and 63, Sugar fails to disclose an antenna transmitting an RTS signal and a CTS signal.

Ikegami discloses a wireless terminal transmitting a RTS and a CTS signal (A, B, C, D of Figure 3; column 4, lines 10-24; column 10, lines 4-21). One of ordinary skill in the art would realize that channel estimate information would be available for use in the CTS signal that had traversed the communication channel in response to a RTS signal.

Ikegami realizes the benefit of greater transmission rates by using a CTS signal and an RTS signal to transfer data frames. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Ikegami with the beamformer and method of Sugar.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian T. O'Connor whose telephone number is 571-270-1081. The examiner can normally be reached on 9:00AM-6:30PM, M-F, 1st Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571-272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Brian T. O'Connor
July 25, 2007

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